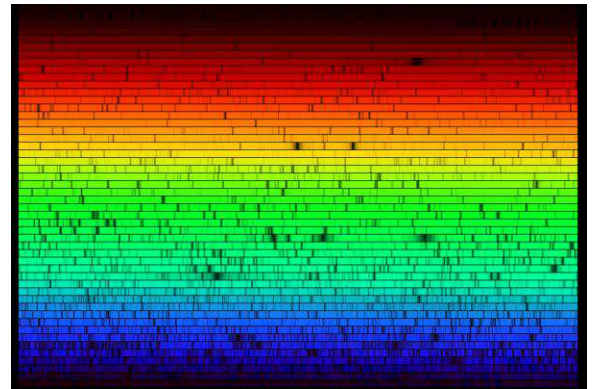


Decoding Starlight

The colour of a glowing gas, like a candle flame, the burner on a gas stove or a star, reveals its temperature: hotter gases glow blue, colder gases glow red. On more careful inspection, though, the light contains an enormous amount of information about the gas: not just its temperature but also its chemical composition, motion and more. This information is found by decoding the spectrum of the gas.

In this tutorial, you'll learn how to “crack the code” and reveal what the glowing objects are made of.

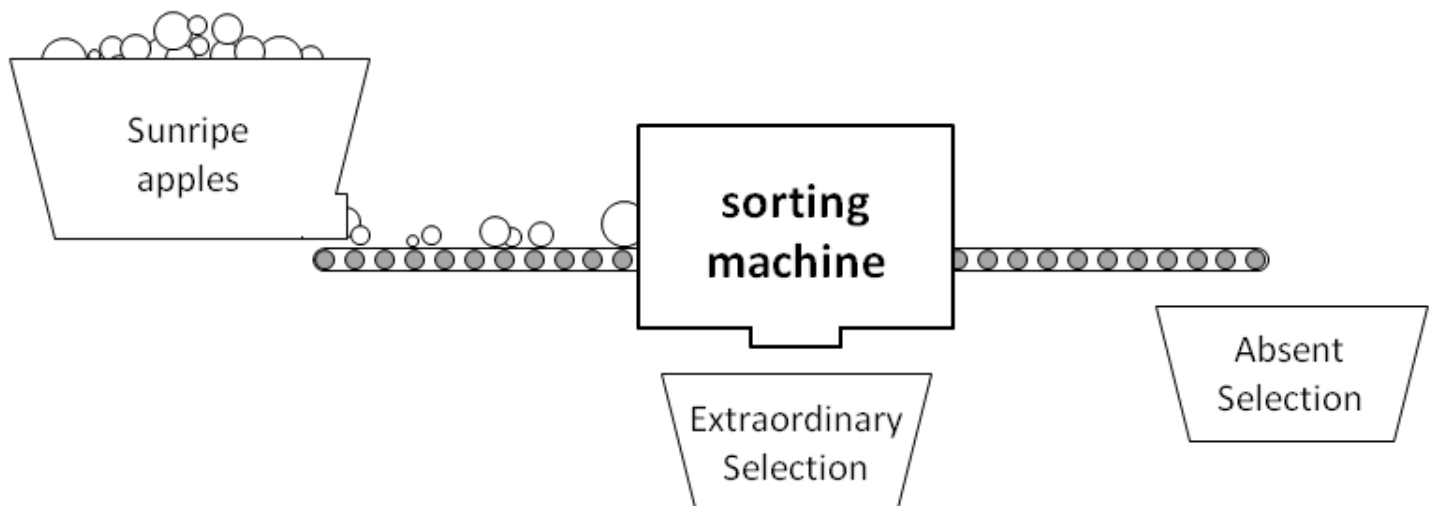


The Sun's spectrum (NOAO)

Part 1: The Sunripe Apple Sorting Machine

In the Fall, apple orchards sell their apples to the Sunripe Company. One of Sunripe's products, *Extraordinary Selection*® apple pie, is made only from certain apples: those with diameters between 60–65 mm and 80–85 mm.

Your job is to **design the sorting machine** that selects the *Extraordinary Selection*® apples out of all the apples processed in the factory. Sketch your design on the whiteboard and be prepared to share your design.



Part 2: A Catalogue of Spectra

Visit each of the 4 stations. At each one, use the diffraction grating slide to see what the spectrum of the gas looks like. Draw the emission spectrum in the space below – the positions of the lines is important, so use the reference spectrum as a guide for where to draw the lines.

Reference spectrum



Gas: _____

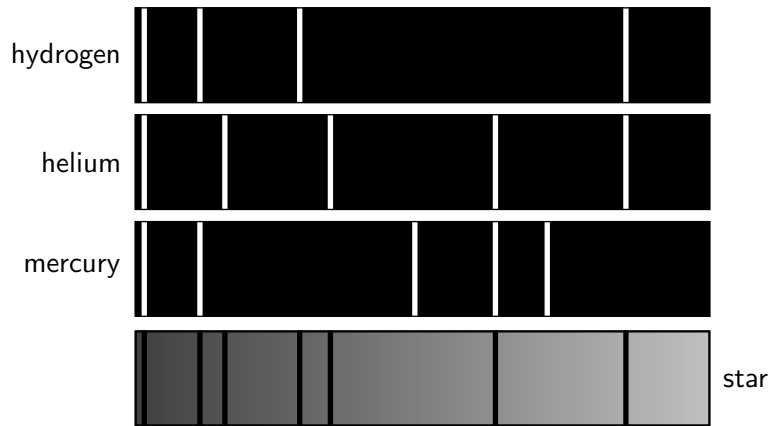
Gas: _____

Gas: _____

Gas: _____

Part 3: Questions Please hand in this worksheet when you are finished.

1. These are the emission spectra of several elements and the absorption spectrum of a star. How many elements are present in the star's atmosphere?



- 2 element 3 elements 7 elements 9 elements

2. The absorption spectra from 2 mystery stars are hanging on the walls in the room. Compare those spectra to your catalogue of emission spectra to figure out the chemical composition of the two stars. (*Psst! Don't write on the mystery spectra or else the next group of students will get the answers!*)

Mystery Star 1 contains _____

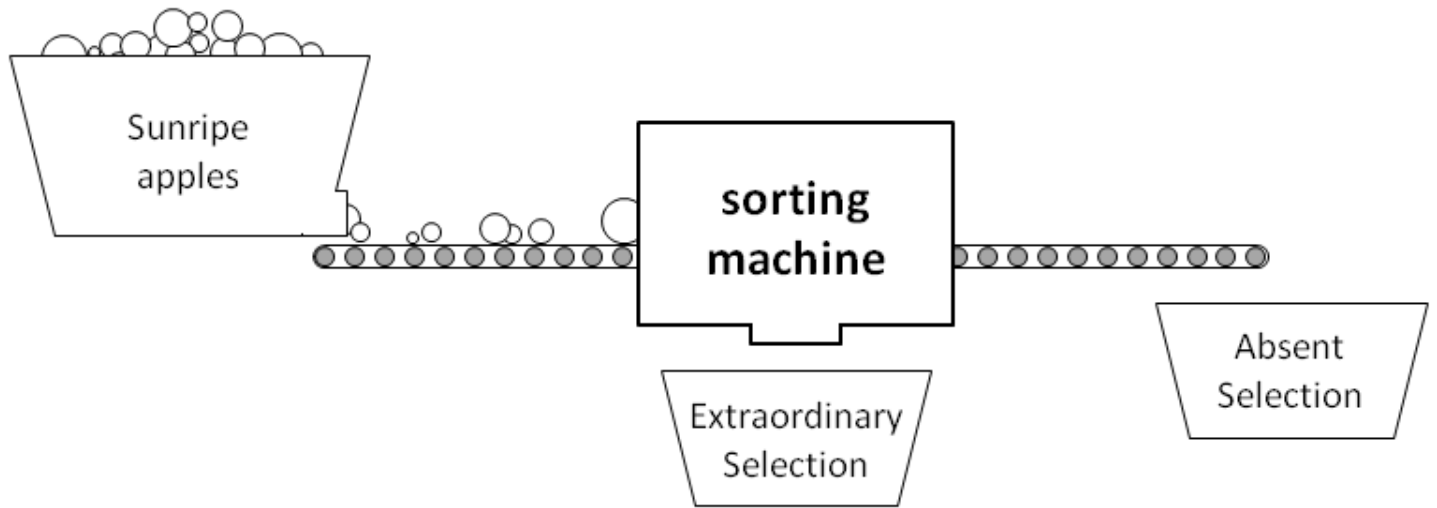
Mystery Star 2 contains _____

3. Look up at the spectrum of the fluorescent lights in this room. Is it a continuous, absorption or emission spectrum?

The atoms in the fluorescent lights **are not** helium, mercury, krypton or neon. Describe how you could use techniques explored in this activity to find out what kinds of atoms are responsible for the light.

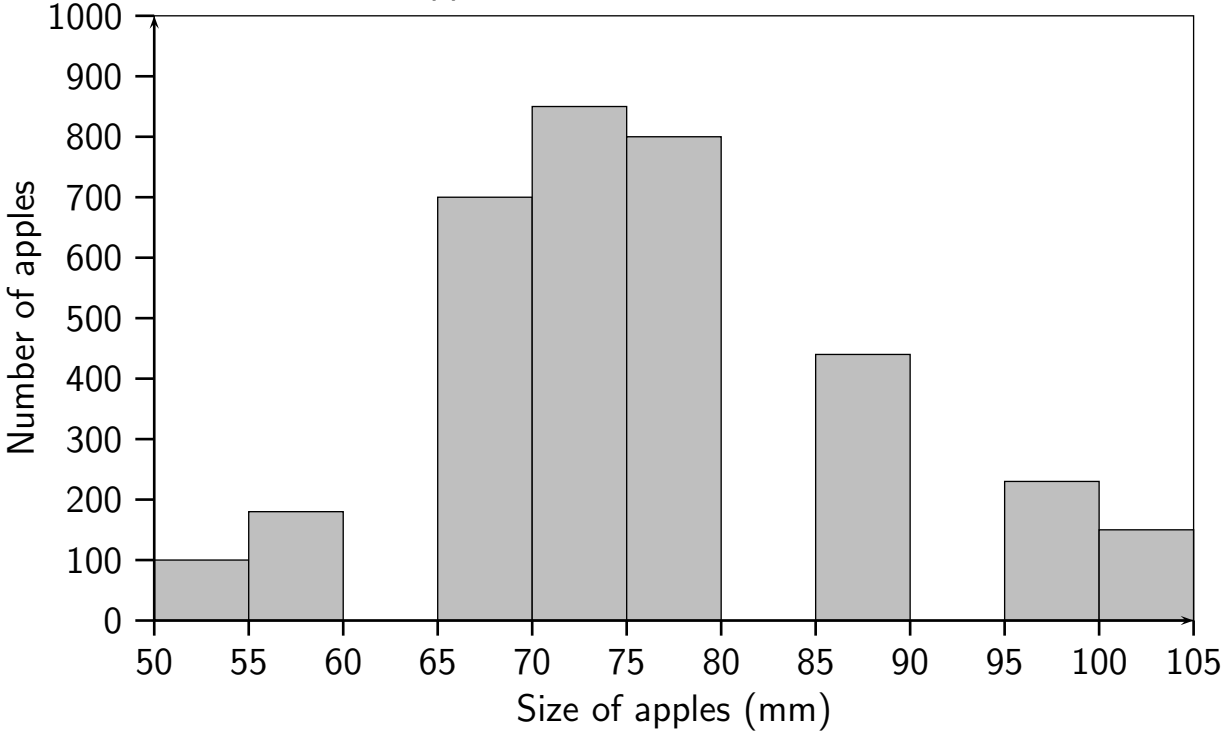
4. Using the symbols A (Absorption), C (Continuous) and E (Emission), which one of the following "spectrum arithmetic" equations is true? (Adapted from the ClassAction collection at astro.unl.edu.)

- $2A - E = C$ $E + C = A$ $C - E = A$ $C + A = 2E$

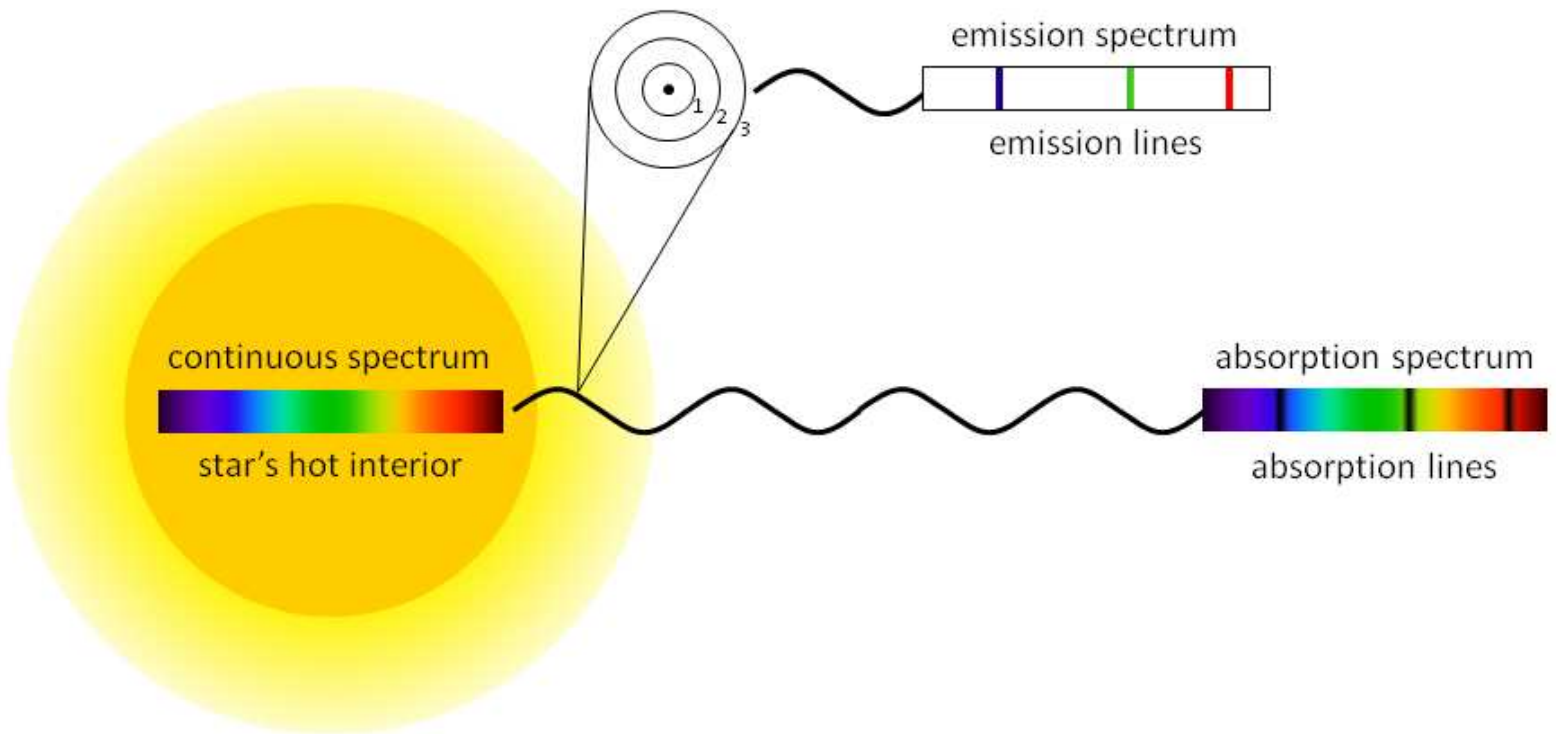
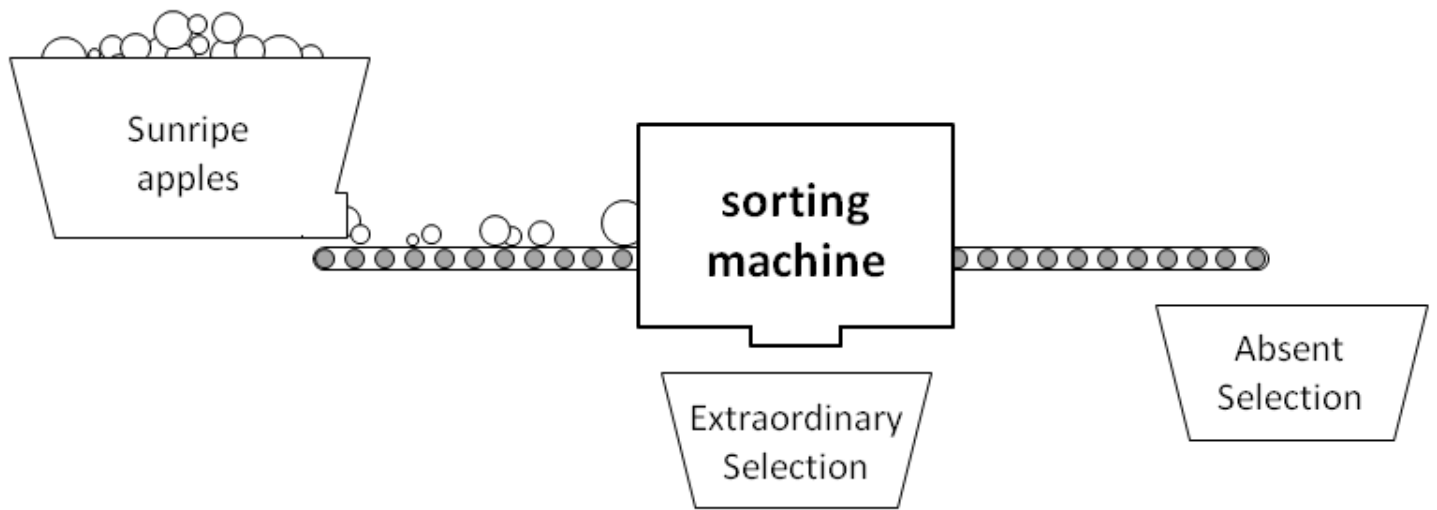


What sizes of apples do you find in the...

Apples in the Absent Selection bin



Product	Apple Sizes Used
pie	60–65, 80–85
juice	70–75, 80–85
sauce	80–85, 90–95
eating	65–75



What kind of light do you find in the...

Catalogue entry for fluorescent lights

reference spectrum



Mystery Star 1



Mystery Star 2

